We claim:

1. An imaging system, comprising:

a plurality of light detectors arranged in a detector array;

a plurality of light sources corresponding to detectors in the detector array and arranged in a source array; and

an optical system disposed with respect to the source array and the detector array so as to illuminate an object with light from the source array and image the object on the detector array, corresponding detectors of the detector array and sources of the source array being disposed in back of the optical system and being arranged so that light radiated from a point on the object illuminated by a given source of the source array is detected by a corresponding detector of the detector array.

2. The imaging system of claim 1, wherein the detector array and the source array are coplanar with one another.

3. The imaging system of claim 1, wherein the detector array and the source array are not coplanar with one another.

4. The imaging system of claim 1, wherein one or more sources in the source array has a plurality of detectors in the detector array that correspond thereto.

5. The imaging system of claim 1, wherein one or more detectors in the detector array has a plurality of sources in the source array corresponding thereto.

6. The imaging system of claim 1, further comprising an optical element disposed between the optical system, on the one hand, and the detectors and sources, on the other

hand, to produce conjugate points in image space coupled respectively to corresponding sources and detectors.

7. The imaging system of claim 6, wherein the optical element comprises a diffractive element optimized to maximize energy in diffraction orders directed respectively toward corresponding detectors and sources.

8. The imaging system of claim 6, wherein the optical element comprises a polarizing element.

9. The imaging system of claim 8, further comprising a circular polarizer disposed between the optical system and the polarizing element so as to produce polarization components along both eigenaxes of the polarizing element.

10. The imaging system of claim 6, wherein the sources emit light at a first wavelength, the detectors respond to light at a second wavelength different from the first wavelength, and the energy splitting element comprises a refractive element.

11. The imaging system of claim 1, wherein the optical system is disposed with respect to the source array and the detector array so that some points on the object plane of the optical system produce respective images at the image plane that encompass a detector and a source corresponding thereto.

12. The imaging system of claim 1, wherein the optical system comprises a microscope.

13. The imaging system of claim 12, further comprising an optical element disposed between the optical system, on the one hand, and the detectors and sources, on the other hand, to produce conjugate points in image space coupled respectively to corresponding sources and detectors.

14. The imaging system of claim 13, wherein the energy splitting element comprises a diffractive element optimized to maximize energy in diffraction orders directed respectively toward corresponding detectors and sources.

15. The imaging system of claim 13, wherein the optical element comprises a polarizing element.

16. The imaging system of claim 15, further comprising circular polarizer disposed between the optical system and the polarizing element so as to produce polarization components along both eigenaxes of the polarizing element.

17. The imaging system of claim 13, wherein the sources emit light at a first wavelength, the detectors respond to light at a second wavelength different from the first wavelength, and the energy splitting element comprises a refractive element.

18. The imaging system of claim 13, wherein the optical system is disposed with respect to the source array and the detector array so that some points on the object plane of the optical system produce respective images at the image plane that encompass a detector and a source corresponding thereto.

19. The imaging system of claim 13, wherein the microscope comprises a confocal microscope.

20. The imaging system of claim 19, further comprising an optical element disposed between the optical system, on the one hand, and the detectors and sources, on the other hand, to produce conjugate points in image space coupled respectively to corresponding sources and detectors.

21. The imaging system of claim 20, wherein the optical element comprises a diffractive element optimized to maximize energy in diffraction orders directed respectively toward corresponding detectors and sources.

22. The imaging system of claim 21, wherein the optical element comprises a polarizing element.

23. The imaging system of claim 22, further comprising a linear polarizer disposed between the optical system and the polarizing element so as to produce polarization components along both eigenaxes of the polarizing element.

24. The imaging system of claim 19, wherein the sources emit light at a first wavelength, the detectors respond to light at a second wavelength different from the first wavelength, and the energy splitting element comprises a refractive element.

25. The imaging system of claim 19, wherein the optical system is disposed with respect to the source array and the detector array so that some points on the object plane of the optical system produce respective images at the image plane that encompass a detector and a source corresponding thereto.

26. The imaging system of claim 13, wherein the microscope includes a diffractive element disposed on the detector side thereof and optimized to maximize efficiency in orders of diffraction corresponding respectively to corresponding detectors and sources.

27. The imaging system of claim 1, wherein the optical system comprises an array of optical elements corresponding to respective detectors of the detector array, the optical elements illuminating an object with light from respective sources of the source array and producing respective images of the object at their respective detectors.

28. The imaging system of claim 27, wherein corresponding detectors and sources are coplanar with one another.

29. The imaging system of claim 27, wherein the optical elements comprise microscopes.

30. The imaging system of claim 29, further comprising optical elements disposed between corresponding microscopes, on the one hand, and their corresponding detectors and sources, on the other hand, to produce conjugate points in image space coupled respectively to corresponding sources and detectors.

31. The imaging system of claim 30, wherein the energy splitting elements comprise diffractive elements optimized to maximize energy directed respectively toward corresponding detectors and sources.

32. The imaging system of claim 29, wherein the optical elements comprise polarizing elements.

33. The imaging system of claim 3, further comprising circular polarizers disposed between the microscopes and their respective Wollaston prisms so as to produce polarization components along both eigenaxes of the Wollaston prisms.

34. The imaging system of claim 29, wherein the sources emit light at a first wavelength, the detectors respond to light at a second wavelength different from the first wavelength, and the optical elements comprises direct view prisms.

35. The imaging system of claim 29, wherein the microscopes are disposed with respect to respective corresponding detectors and sources so that a point on the object plane of a microscope produces an image at the image plane of the microscope that encompasses a detector and a source corresponding thereto.

36. The imaging system of claim 29, wherein the microscopes are confocal microscopes.

37. The imaging system of claim 29, wherein the sources emit light at a first wavelength and the detectors respond to light at a second wavelength different from the first wavelength for epi-fluoresence microscopy.

38. The imaging system of claim 1, wherein the sources emit light at a first wavelength and the detectors respond to light at a second wavelength different from the first wavelength for epi-fluoresence microscopy.

39. An equalization system adopted for use with an imaging system having a plurality of light detectors arranged in a detector array, a light source, and an optical system disposed with respect to the light source and the detector array so as to illuminate an object with light from the light source and image the object on the detector array, the equalization system comprising:

a signal conditioning circuit for receiving and digitizing output signals from a respective set of a plurality of light detectors so as to produce a respective set of output values; and

an equalizer system for equalizing said respective set of output values for a given amount of optical input power supplied to the detectors.

40. The equalization system of claim 39, combined with an epi-illumination imaging system for producing an image at said detector array.

41. The equalization system of claim 40, wherein said light source comprises an array of individual light-emitting sources corresponding to respective said light detectors.

42. The equalization system of claim 39, combined with a trans-illumination imaging system for producing an image at said detector array.

43. The equalization system of claim 42, wherein said light source comprises an array of individual light-emitting sources corresponding to respective said light detectors.

44. The equalization system of claim 42, wherein said light source comprises a single-axis illumination system.

45. The equalization system of claim 44, wherein said light source includes an extended light emitting source.

46. The equalization system of claim 39, wherein said equalizer system is adapted to adjust one or more of said output values according to a respective error correction value so as to produce new respective values that are substantially equal for said given amount of input power.

47. The equalization system of claim 46, wherein correction values are added to one or more of said output values to correct for detector offset variances.

48. The equalization system of claim 46, wherein one or more of said output values are multiplied by correction values to correct for dynamic range variances.

49. The equalization system of claim 39, wherein said signal conditioning circuit includes a set of amplifiers corresponding to said set of said plurality of light detectors which apply gain to said output signals prior to digitization thereof, and said equalizing system provides correction signals to said amplifiers based on said output values so as to equalize said output values for said given amount of input power.

50. The equalization system of claim 49, wherein said amplifiers are adapted to adjust their gain in response to said correction signals.

51. The equalization system of claim 49, wherein said amplifiers are adapted to adjust their output offset in response to said correction signals.

52. The equalization system of claim 49, wherein said amplifiers are adapted to adjust their gain and output offset in response to said correction signals.

53. The equalization system of claim 49, further comprising a plurality of analog-to-digital converters for converting said outputs of said amplifiers to digital form, said analog-to-digital converters being adapted to receive said correction signals and adjust their offsets in response thereto so as to compensate for offset variances among said plurality of light detectors.

54. The equalization system of claim 39, wherein said light source comprises an array of individual light-emitting sources corresponding to respective said light detectors, said equalization system further comprising a power supply adapted to supply to a plurality illumination light sources corresponding to said plurality of detectors respective amounts of power that have definite relative magnitudes with respect to one another, said equalizer system being adapted to equalize said set of output values by adjusting the relative amounts of power applied to said set of said plurality of light sources.

55. The equalization system of claim 54, wherein said equalizing system is adopted to provide correction signals to said power supply based on said output values so as to adjust the relative amounts of power applied to said set of said plurality of light-emitting sources and to adjust one or more of said output values based on a respective error correction value so as to produce new respective values that are substantially equal for said given amount of input power thereby equalize said output values.

56. The equalization system of claim 54, wherein said signal conditioning circuit includes a set of amplifiers corresponding to said set of said plurality of light detectors which apply gain to said output signals prior to digitization thereof, and said equalizer system is adapted to provide correction signals to said power supply based on said output values so as to adjust the relative amounts of power applied to said set of said plurality of light-emitting sources and to provide correction signals to said amplifiers based on said output values so as to equalize said output values for said given amount of input power.

57. The equalization system of claim 56, wherein said equalizer is further adapted to add to one or more of said output values respective error correction values so as to

produce new respective values that are substantially equal for said given amount of input power.

58. The equalization system of claim 39, wherein said equalizer system is adapted to cause said set of output values to represent a non-linear response to light received by said respective set of said plurality of detectors.

59. The equalization system of claim 39, wherein said equalizer system is adapted to add to one or more of said output values a respective error correction value so as to produce new respective values that are substantially equal for said given amount of input power.

60. The equalization system of claim 39, wherein said equalizer system is adapted to multiply one or more of said output values a respective error correction value so as to produce new respective values that are substantially equal for said given amount of input power.

61. A method for providing epi-illumination in an imaging system, comprising:

arranging in an array a plurality of light detectors in back of the imaging system so as to receive an image produced by the imaging system; and

arranging in an array a plurality of light sources corresponding to respective said light detectors so as to provide illumination in front of the imaging system.

62. The method of claim 61, further comprising arranging the sources so as to be interspersed among the detectors.

63. The method of claim 61, further comprising arranging the sources and the detectors in the same plane.

64. The method of claim 61, further comprising arranging the sources and the detectors in different planes.

65. The method of claim 61, further comprising providing a plurality of detectors corresponding to one or more sources.

66. The method of claim 61, further comprising providing a plurality of sources corresponding to one or more detectors.

67. The method of claim 61, further comprising providing an optical element in back of the imaging system so as to produce conjugate points coupled respectively to corresponding sources and detectors.

68. The method of claim 66, wherein providing an optical element comprises providing a diffractive optical element.

69. The method of claim 66, wherein providing an optical element comprises providing a refractive optical element.

70. The method of claim 66, wherein the sources emit light at a first wavelength and the detectors respond to a second, different wavelength, and providing an optical element comprises providing a dispersive optical element.

71. The method of claim 61, further comprising arranging the detectors and the sources so that some points on the object plane of the optical system produce respective images that encompass a detector and a source corresponding thereto.

72. The method of claim 61, further comprising using the imaging system as a microscope.

73. The method of claim 72, further comprising providing an optical element in back of the imaging system so as to produce conjugate points coupled respectively to corresponding sources and detectors.

74. The method of claim 73, wherein providing an optical element comprises providing a diffractive optical element.

75. The method of claim 73, wherein providing an optical element comprises providing a refractive optical element.

76. The method of claim 73, wherein the sources emit light at a first wavelength and the detectors respond to a second, different wavelength, and providing an optical element comprises providing a dispersive optical element.

77. The method of claim 72, further comprising arranging the detectors and the sources so that some points on the object plane of the optical system produce respective images that encompass a detector and a source corresponding thereto.

78. The method of claim 72, further comprising using the imaging system as a confocal microscope.

79. The method of claim 78, further comprising providing an optical element in back of the imaging system so as to produce conjugate points coupled respectively to corresponding sources and detectors.

80. The method of claim 79, wherein providing an optical element comprises providing a diffractive optical element.

81. The method of claim 79, wherein providing an optical element comprises providing a refractive optical element.

82. The method of claim 79, wherein the sources emit light at a first wavelength and the detectors respond to a second, different wavelength, and providing an optical element comprises providing a dispersive optical element.

83. The method of claim 78, further comprising arranging the detectors and the sources so that some points on the object plane of the optical system produce respective images that encompass a detector and a source corresponding thereto.

84. The method of claim 61, further comprising forming the imaging system from a plurality of discrete optical systems arranged in an array so that corresponding sources and detectors correspond to a discrete optical system.

85. The method of claim 84, further comprising arranging corresponding detectors and sources coplanar with one another.

86. The method of claim 84, further comprising using the discrete optical systems as array microscope.

87. The method of claim 86, further comprising providing one or more optical elements in back of the imaging system so as to produce conjugate points coupled respectively to corresponding sources and detectors.

88. The method of claim 87, wherein providing one or more optical elements comprises providing one or more diffractive optical elements.

89. The method of claim 87, wherein providing one or more optical elements comprises providing one or more refractive optical elements.

90. The method of claim 87, further comprising arranging the detectors and the sources so that some points on the object plane of a discrete optical system produce respective images that encompass a detector and source corresponding thereto.

91. The method of claim 86, further comprising using the imaging system as a confocal microscope.

92. The method of claim 91, further comprising using the imaging system as a epi-fluorescence microscope.

93. The method of claim 61, further comprises using the imaging system as an epi-fluorescence microscope.

94. A method for equalizing the output values of a photo-electronic imaging system for said given amount of input power, comprising:

supplying a given amount of input power to an illumination light source in a photo-electronic imaging system;

receiving and digitizing output signals from a respective set of a plurality of light detectors in the imaging system so as to produce a respective set of output values; and

equalizing said set of output values for said given amount of input power.

95. The method of claim 94, wherein said equalizing said set of output values for a given amount of input power comprises adding to one or more of said output values a respective error correction value so as to produce new respective values that are substantially equal for said given amount of input power.

96. The method of claim 94, wherein said equalizing said set of output values for a given amount of input power comprises multiplying one or more of said output values a respective error correction value so as to produce new respective values that are substantially equal for said given amount of input power

97. The method of claim 94, further comprising providing a set of amplifiers corresponding to said set of said plurality of light detectors for providing gain to the

output signals, wherein an error signal is applied to the amplifiers based on said output values so as to equalize said output values for the given amount of input power.

98. The method of claim 97, wherein the error signal is applied so as to adjust the gain of the amplifiers and thereby equalize said output values for the given amount of input power.

99. The method of claim 97, wherein the error signal is applied so as to adjust the offset of the amplifiers and thereby equalize said output values for the given amount of input power.

100. The method of claim 97, further comprising providing a set of analog-to-digital converters corresponding and responsive to the amplifiers, and wherein error signals are provided to the analog-to-digital converters to adjust their respective offsets so as to equalize the output values there from.

101. The method of claim 97, wherein the error signal is applied so as to adjust the gain and offset of the amplifiers and thereby equalize said output values for the given amount of input power.

102. The method of claim 94, wherein supplying a given amount of power to an illumination light source comprises supplying to a set of individual light-emitting sources respective amounts of power that have definite relative magnitudes with respect to one another so as to equalize said output values.

103. The method of claim 94, wherein said equalizing is adapted to produce a non-linear response to light received by said respective set of said plurality of detectors.